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Pathological Imaging System for Diagnosis Support

ATSUSHI OKUZAWA*1), OKIO HINO*2), MIHO TADA*3), SATOSHI NAKATA*4)

*1) Department of Coloproctological Surgery, Juntendo University Faculty of Medicine, Tokyo, Japan. *2) Department of Pathology and Oncology, Juntendo University Faculty of Medicine, Tokyo, Japan. *3) Industrial Solution Sales Dept. 2, Sales Division, Hitachi Industry & Control Solutions, Ltd., Tokyo, Japan. *4) Image System Design Dept., Image System Solution Division, Hitachi Industry & Control Solutions, Ltd., Ibaraki, Japan

Background: With the increasing incidence of cancer, the number of cases in need of pathological diagnosis has been growing. The number of pathologists is still insufficient, accounting for only about 0.6% of medical doctors in Japan. In addition, accurate diagnosis is an urgent issue in the field of oncology, where the workload in a clinical setting has increased.

In order to facilitate pathological examination, in this study, we developed a new pathological imaging system that screens tissue samples before pathologists test them. Our proposed system is expected to reduce the burden on pathologists, and also to help pathologists to perform more accurate diagnosis of those diseases, especially rare cancers, that need more careful examination.

Methods: Pathological images of clinical samples are produced by shape-of-microscopic-features acquisition equipment in a clinical examination. Our machine learning module, using principal component analysis, neural network, support vector machine, AdaBoost, or random forest, for example, makes it possible to perform pattern matching and to classify a benign or malignant pattern. The pattern recognition classification can determine benignancy or malignancy from pathological images automatically in our proposed pathological image system.

Conclusion: The validity of the developed image recognition algorithm to perform rough classification may currently be slightly controversial. However, the accuracy of the image recognition algorithm will be improved after feedback from clinicians. Future diagnostic imaging systems will enable effective classification of images and have the possibility of being used as educational tools. Our expectation is that this approach can reduce the workload of pathologists. This work has just started, but it should contribute to future diagnosis to determine the pathological type of any malignancy based on the classified images.

Key words: pathological diagnosis, pathological images, pattern recognition classifier

Figure 1 Pathological image analysis using machine learning method